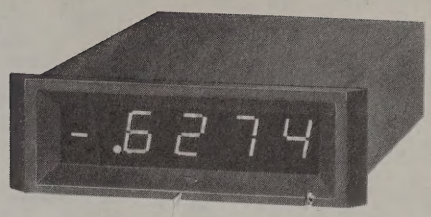
PM-4 4-digit panel meter

INSTRUCTION MANUAL



INTRODUCTION

The PM-4 Digital Panel Meter is a four-digit, fixed range instrument with automatic polarity. The instrument is available in any one of four ranges: ±1 volt F.S., ±10 volts F.S, ±100 volts F.S. or ±1000 volts F.S. Modification from any one range to another is easily accomplished by the substitution, addition or deletion of one to three resistors.

The PM-4 includes an automatic zeroing feature which eliminates zero drift and its calibration is readily accomplished by the adjustment of one potentiometer accessible at the rear of the instrument. For operation, an external 5-volt power supply is required. See figure 1 for a typical 5-volt power supply circuit.

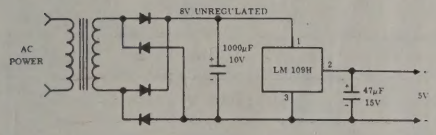


Figure 1. Typical Power Supply

SPECIFICATIONS

RANGE: ±1 volt ±.0000 to ±.9999 VDC,
or ±10 volt ±0.000 to ±9.999 VDC,
or ±100 volt ±00.00 to ±99.99 VDC,
or ±1000 volt ±000.0 to ±999.9 VDC

ACCURACY: ±0.02% Full Scale

SPEED: 2 readings/second, nominally

OPERATING TEMPERATURE: 0°C to +60°C

POWER: +5 VDC ±5% @ 100 mA, 0.5W

SIZE: 15/16"H x 2-1/2"W x 3-1/4"D

WEIGHT: 4 oz.

CONTROL: Scale Factor; screwdriver adjust at rear, ±4% nominally

DISPLAY: LED, red, 0.31" H

TURN-ON TIME: 10 sec. to 0.05% accuracy

T/C: ±(0.005% rdg + 0.001% F.S.)/°C

INPUT Z: 1 V range, 1000 MΩ; 10V range, 1 MΩ; 100V & 1000V range, 10 MΩ

SETTLING TIME: 2 sec, including polarity change

COMMON MODE COMPLIANCE: ±100 mV between SIG LO & NEG. TERM of 5V Supply

DECIMAL LOCATION: May be positioned by jumper on connector to any of four locations, ±.X.X.X.X

CONTROL SIG: Hold line to inhibit further readings

SPECIFICATIONS (cont)

OUTPUT SIG: Busy/Done 5V logic level change

INPUT CURRENT: ±200 pA

INPUT VOLTAGE PROTECTION: ±150 VDC or 150 VRMS max., 1V & 10V ranges, ±1000 VDC or 1000 VRMS max., other ranges

MEASUREMENT METHOD: Integration, Input Integration Time - 100 mS

OVERLOAD INDICATION: "10000" with the "1" flashing is displayed for all inputs exceeding full scale

ZERO STABILITY: Auto-zeroing eliminates zero drift

OPERATING PRINCIPLES (See figure 2.)

INPUT CIRCUIT

Very high impedance minimizes the effect of the meter on the signal being measured. The bias current of the input amplifier is a maximum of only 50 picoamperes, due to use of a monolithic J-FET input operational amplifier. This is complemented by very low leakage input clamp diodes and MOS-FET switches.

A/D CIRCUIT

Analog-to-digital conversion is performed by simultaneous integration of analog signals and counting of clock pulses. Input integration time is fixed at 100 msec. Total conversion, including automatic compensation for zero drift, takes about 500 msec. All logic signals are handled by C-MOS integrated circuits or by an MOS-LSI circuit.

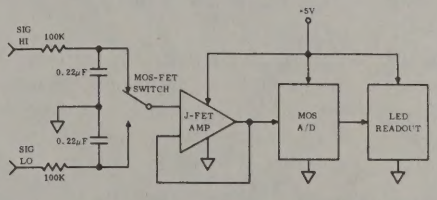


Figure 2. Simplified Schematic Diagram

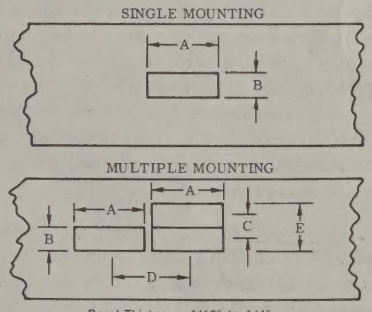
DISPLAY

Light-emitting diodes (LED) arranged to form seven-segment numerals provide the digital display. Electrical energy is converted to light within the LED, eliminating the need for light bulbs. In addition to the digital display, LEDs are grouped to display plus and minus signs to indicate polarity, an over-range "one" to indicate an overload, and four decimal points.

INSTALLATION

1. Mount the PM-4 as follows:
   a. Cut hole in panel (figures 3 & 4).
   b. Slide trim plate over PM-4 housing, facing beveled edge of trim plate forward.
   c. Insert PM-4 through the cut-out in the panel from the front of the panel.
   d. Fit mounting clips (2) into the slots at the sides of the PM-4. The foot of the clip should face forward.
   e. Thread the screws (2) into clips and tighten the screws against the rear surface of the panel.

2. Install a keying tab in the connector to mate with the PM-4 between contacts 1 and 2. The connector should be SAE P/N SAC10D/1-2 or equivalent. (See table I for connector pin information.)



DIMENSIONS (Inches)

	Panel Cutout With Trim Plate	Center Line Without Trim Plate	Center Line With Trim Plate	Cutout For Multiple Mounting Without Trim Plate
A	2-17/32			
B	31/32			
C		15/16	1-3/16(Min)	
D		3-1 9/(Min)	3-1/8(Min)	
E				No. of Units x 15/16

Figure 3. Mounting Data

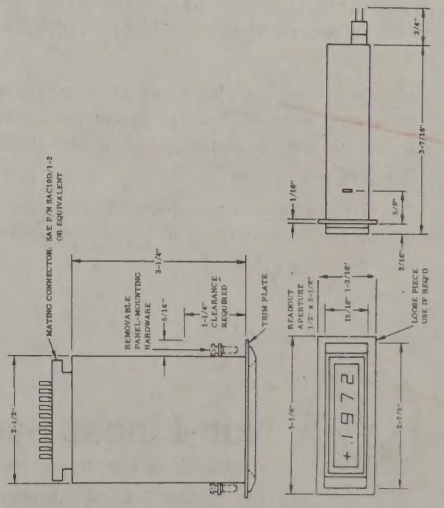


Figure 4. Outline Drawing

Table I. Connector Pin Information

Pin No.		Pin Letter	
1	Decimal Pt. Com.	A	10^0 Decimal
2	Busy/Done Output	B	10^1 Decimal
3	Hold	C	10^2 Decimal
4	N/C	D	10^3 Decimal
5	Signal Low	E	N/C
6	N/C	F	N/C
7	N/C	H	Signal High
8	+5V Power	J	N/C
9			
10	Polarity Enable	K, L	Power Ground (negative side of +5V Supply)

OPERATION

1. Power Supply. Connect the negative side of your 5V supply to pins K and L of the connector and the positive side to pins 8 and 9. Even though the current requirements of the PM-4 are low (100 mA max.), redundant contacts are used to enhance the reliability of the connection.

2. Signal. Connect the signal to be measured to pin H of the connector. A shielded lead may be needed if the signal has a high source resistance. Connect the low side of the signal to be measured to pins 5 and K of the connector. It will usually be better to do this with two separate wires rather than a jumper across 5 and K at the connector. This will eliminate current flow through the signal low connection to pin 5.

3. Polarity Display. Jumper between pins 9 and 10 of the connector to display the polarity of the input signal. If polarity is not desired, do not install the jumper.

4. Decimal Indicator. Jumper between pin (1) and pins (A), (B), (C) or (D) depending on which decimal point is to be illuminated. See below. If a decimal is not desired, do not install a jumper.

Decimal location	+	1	.	0	.	0	.	0	.	0
Pin No.			D		C		B		A	

5. Display "Hold." To inhibit readings, jumper pin 3 to pins K or L with contact closure or saturated open collector NPN transistor.

6. Connector. Plug connector onto P/C fingers at rear of PM-4. Orient connector so the keying tab mates with the slot in the P/C board.

7. Readings. Apply power and signal. Within 10 seconds the PM-4 will display the correct reading ±.05%. Within 5 minutes, the PM-4 will display its final warmed-up reading unless the associated equipment takes longer to warm up.

NOTE

If it is desired to power the PM-4 from a +5V supply which is not floating with respect to the signal to be measured, the following conditions must be met. The supply must be well regulated, have low impedance, and be noise-free. The negative side of the supply and the low side of the signal must be within 100 mV of each other.

CALIBRATION

1. Ensure a 5-minute warm-up period.

2. Verify the +5 volt power supply voltage. If necessary adjust to +5V (±0.1V).

3. With precision DC power supply, apply +.9000 VDC to instrument. Adjust potentiometer R1 at rear of meter until readout displays +.9000.

NOTE

The voltage to be applied in step 3 above is for a 1-volt (F.S.) Meter. For a 10-volt (F.S.) meter, apply 9.000 volts; a 100-volt (F.S.) meter, 90.00 volts; and a 1000-volt (F.S.) meter, 900 volts.

RANGE MODIFICATION

To change range on the PM-4 Digital Panel Meter, perform the following steps:

1. Insert a small screwdriver or pen knife between case and rear cover, midway on case above printed circuit connector, and pry gently outward. Remove rear cover.

2. Slide panel meter assembly from case. Observe that red filter is now a loose piece, and will be required for reassembly.

3. Carefully separate top and bottom printed circuit assemblies by pulling them apart. There are no retaining devices used and only the contact pressure of pins to sockets hold the boards together. Use care so as not to bend or break connecting posts.

4. All modifications are accomplished on the upper board (assembly without the readout).

5. Observe resistor values that are in unit and compare to figure 5 and table II below. Install values of resistors as specified in table II to attain desired range. Check against schematic in figure 6.

6. Jumper between pin (1) and pins (A), (B), (C) or (D) depending on which decimal point is to be illuminated. See figure 7. If a decimal is not desired, do not install a jumper.

7. Clean all solder joints and adjacent areas on printed circuit board to minimize leakage paths.

8. Reassemble unit by reversing steps 1, 2 and 3.

9. Matched attenuator resistor sets are available from the factory; specify the range when ordering.

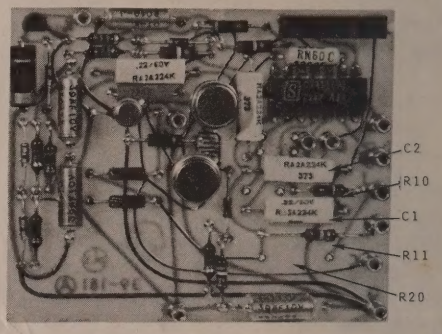


Figure 5. Component Location

Table II. Resistor Values in Range Modification Kits

PART NO.	RANGE	R10	R11	R20
39-189-1	1V	100K 5%	100K 5%	Omit
39-189-2	10V	100K 5%	909K 1%	100K 1%
39-189-3	100V	100K 5%	10 M 1%	100K 1%
39-189-4	1000V	10K 5%	10 M 1%	10K 1%

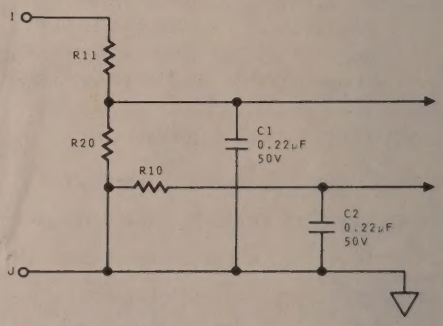


Figure 6. Simplified Schematic, Range Resistors

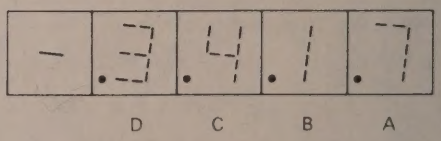


Figure 7. Decimal Point Location

Non-Linear Systems, Inc.
Originator of the digital voltmeter.
Box N, Del Mar, California 92014 Telephone (714) 755-1134 TWX 910-322-1132

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